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- II. "On the Genera *Heterophyllia*, *Battersbyia*, *Palæocyclus*, and *Asterosmilæ*; the Anatomy of their Species, and their Position in the classification of the Sclerodermic Zoantharia." By Dr. P. M. DUNCAN, Sec. G.S. Communicated by Prof. HUXLEY. Received March 30, 1867.

(Abstract).

Although the practical and natural classification of the Madreporaria (Sclerodermic Zoantharia) which has been submitted by MM. Milne-Edwards and Jules Haime is very generally admitted to be the best, still there are great gaps in the succession of the genera, and, moreover, some genera cannot be placed.

The "break" between the Turbinolides and the Astræides is so great as to render the classification rather artificial; but Dr. Duncan's discovery of a genus *Asterosmilæ*, comprising several species, unites these great divisions. The new genus has the peculiarities of the Trochocyathi, but in addition it is furnished with an endotheca. The species are described.

The genera *Heterophyllia*, McCoy, and *Battersbyia*, Milne-Edwards and Jules Haime, are amongst those *incertæ sedis*. The discovery of several new species of *Heterophyllia* enables Dr. Duncan to determine the anatomy of the genus, to offer for consideration the most extraordinary coral form he has ever seen, and to ally the genus with *Battersbyia*, which he proves had no cœenchyma. The species of both of the genera are described shortly, and the development and reproduction of *B. gemmans* also. The genera are placed amongst the Astræidæ.

The genus *Palæocyclus*, M.-E. & J. H., supposed to be one of the Fungidæ, is proved to be a vesiculo-tubulate coral genus, and to be one of the Cyathophyllidæ.

One Mesozoic family is therefore removed from the Palæozoic coral-fauna, and two genera of a Mesozoic division are introduced. They foreshadow the Thecosmilæ of the Trias.

- III. "Contribution to the Anatomy of *Hatteria* (*Rhynchocephalus*, Owen)." By ALBERT GÜNTHER, M.A., Ph.D., M.D. Communicated by Prof. OWEN. Received April 4, 1867.

(Abstract.)

The skull of *Hatteria* is distinguished by the following characters:—

1. Persistence of the sutures, especially of those between the lateral halves of the skull, combined with great development of its ossified parts, as it appears in the expanse of the bones forming the upper surface of the facial portion, in the completeness of an orbital ring with a temporal and zygomatic bar (Crocodylia), in the much expanded columella, in the nearly completely osseous bottom of the orbit, and roof of the palate.

2. Sutural union of the tympanic with the skull; firm and solid union of the bones of the palate with the tympanic, as shown by the sutural connexion of tympanic and pterygoid, broad sutural connexion of the columella with tympanic and pterygoid, immoveable pterygo-sphenoid joint, firm and extensive attachment of pterygoid to ectopterygoid.

3. This restriction of the mobility of the bones named is compensated by an increased and modified mobility of the lower jaw, the mandibles being united by ligament, and provided with a much elongate articular surface.

4. Displacement of the palatine bones, which are separated by the pterygoids, and replace a palatal portion of the maxillaries.

5. Perforation of the tympanic; extremely short postarticular process of the mandible.

The *vertebral* column and the *remainder of the skeleton* show the following peculiarities:—

1. Vertebrae amphicoelian; caudal vertebrae vertically divided into two equal halves. Points of minor importance are the uniform development of strong neural spines, and the direction of the caudal pleurapophyses which point forwards.

2. The costal hæmapophyses are modified, first, into a series of appendages identical in position with the uncinatæ processes of birds; and secondly, into a double terminal series connecting the ribs with the thoracic and abdominal sterna, the distal pieces being much dilated and forming the base of a system of muscles (retractors of the abdominal ribs).

3. The development of a system of abdominal ribs, standing in intimate and functional relation to the ventral integuments.

4. Continuity of the ossification of the coracoid; presence of an acromial tuberosity of the scapula; subvertical direction of the os ilium.

5. The arrangement of the bones of the limbs and their muscles does not show any deviation from the Lacertian type.

The *dentition of Hatteria* is unique. That of young examples differs scarcely from the dentition of other acrodont lizards. In adult examples the intermaxillaries are armed with a pair of large cutting-teeth; a part of the lateral teeth are lost, and the alveolar edges of the jaws are cutting and highly polished, performing the function of teeth. A series of palatine teeth is in close proximity and parallel to the maxillary series, both series receiving between them in a groove the similarly serrated edge of the mandible.

As regards the *organs of sense*, the absence of the pecten of the eye and of the tympanic cavity, the commencement of a spiral turn of the cochlea, and the attachment of the hyoid bone to the terminal cartilage of the stapes—are to be noticed.

The structure of the *heart* and of the organs of *respiration* and *circulation* are of the Lacertian type.

The *absence of a copulatory organ* is a character by which *Hatteria* is

distinguished from all other Saurians. Thus *Hatteria* presents a strange combination of elements of high and low organization, and must be regarded as the type of a distinct group. Its affinities and systematic position may be indicated in the following synopsis of RECENT REPTILIA :—

I. *SQUAMATA*.

First order. *Ophidia*.

Second order. *Lacertilia*.

Suborder A. *Amphisbænoidea*.

Suborder B. *Cionocrania*.

Suborder C. *Chamæleoidea*.

Suborder D. *Nyctisaura*.

Third order. *Rhynchocephalia*.

II. *LORICATA*.

Fourth order. *Crocodylia*.

III. *CATAPHRACTA*.

Fifth order. *Chelonia*.

IV. "On the Curves which satisfy given conditions." By Prof. CAYLEY,  
F.R.S. Received April 18, 1867.

(Abstract.)

The present memoir relates to portions only of the subject of the curves which satisfy given conditions; but any other title would be too narrow: the question chiefly considered is that of finding the number of the curves which satisfy given conditions; the curves are either curves of a determinate order  $r$  (and in this case the conditions chiefly considered are conditions of contact with a given curve), or else the curves are conics; and here (although the conditions chiefly considered are conditions of contact with a given curve or curves) it is necessary to consider more than in the former case the theory of conditions of any kind whatever. As regards the theory of conics, the memoir is based upon the researches of Chasles and Zeuthen, as regards that of the curves of the order  $r$ , upon the researches of De Jonquières: the notion of the quasi-geometrical representation of conditions by means of loci in hyper-space is employed by Salmon in his researches relating to the quadric surfaces which satisfy given conditions. The papers containing the researches referred to are included in a list subjoined. I reserve for a separate second memoir the application to the present question, of the Principle of Correspondence.